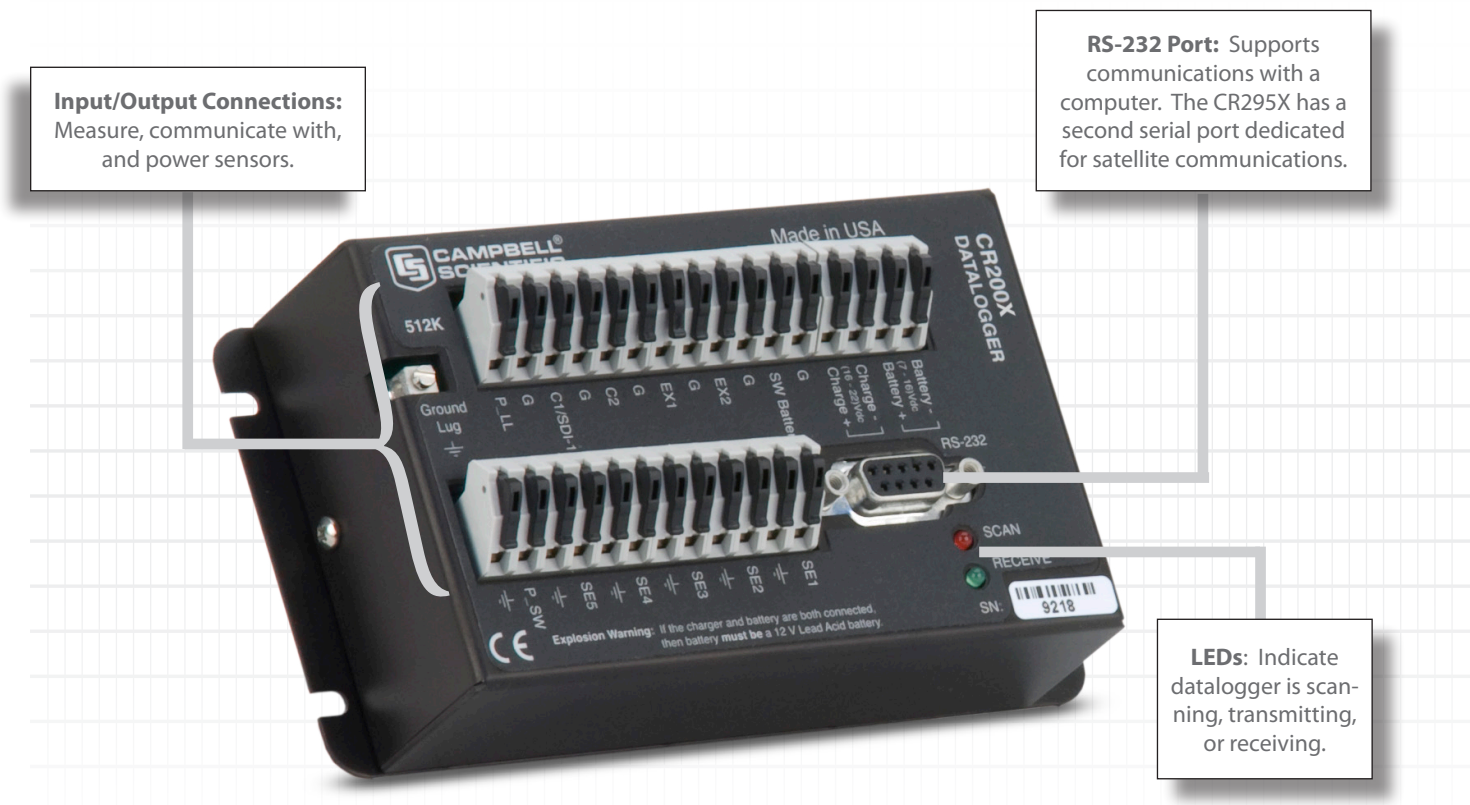
CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

CR200X Series

Measurement and Control Dataloggers

Rugged, Reliable, and Ready for any Application

CR200X-Series[a] Dataloggers/Wireless Sensors


Input/Output Connections: Measure, communicate with, and power sensors.
RS-232 Port: Supports communications with a computer. The CR295X has a second serial port dedicated for satellite communications.
LEDs: Indicate datalogger is scanning, transmitting, or receiving.
CAMPBELL SCIENTIFIC
Made in USA
CR200X DATALOGGER
512K
Ground Lug
RS-232
SCAN
RECEIVE
SN:
9218
Explosion Warning: If the charger and battery are both connected, then battery must be a 12 V Lead Acid battery.

Benefits and Features

- Campbell Scientific's smallest, lowest cost datalogger
- Optimal for measuring one or two simple sensors
- 512 kB of flash final storage memory; ~125,000 data points
- Fastest scan rate of once per second
- 12-bit analog to digital conversions
- Gas Discharge Tube (GDT) protected inputs
- Data values stored in tables with a time stamp and record number
- Battery-backed clock that ensures accurate time is maintained while a CR200X-series datalogger is disconnected from battery power
- PakBus® communication protocol used, which is a simplified variation of Internet protocols

Input/Output Channels

Gas discharge tubes provide rugged electrostatic discharge protection for the inputs. The CR200X-series loggers have five single-ended analog inputs, one switch closure pulse input, one low level ac pulse input, two control ports, two excitation channels (2.5 or 5 V), and one switched battery output. One of the control ports can be used as an SDI-12 port. Input voltage range is 0 to +2500 mV with 0.6 mV resolution. Please note that differential measurements are not supported.

Program/Data Storage

Programs and data are stored in a non-volatile Flash memory. Final storage has 512 kB of memory that provides approximately 125,000 data points in the table-based memory structure.

[a]The CR200X-series dataloggers replaced the CR200-series dataloggers in December 2009. The CR200X-series datalogger allows 128 public variables instead of 48 and allows eight tables instead of four. The compiled CRBasic program of a CR200X-series datalogger can be two times larger than the compiled CRBasic program of a CR200-series datalogger. For the CR200X series, all supported CRBasic instructions are in a single operating system version.

Models/Communications

All of the models can communicate with a PC via direct connect, NL201 Network Link Interface, NL240 Wi-Fi Network Link, MD485 multidrop modem, and our digital cellular modems. Data can also be viewed on an iOS device, an Android device, CD295 DataView II Display, or a user-supplied PDA. To use an iOS or Android device, go to the Apple Store or Google Play and purchase our LoggerLink Mobile Apps. User-supplied PDAs require either PConnect or PConnectCE software.

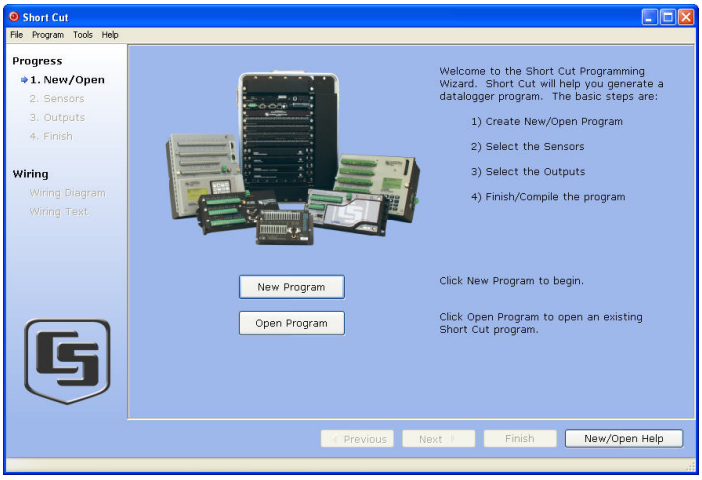
Other communications are model specific. The CR200X is the base datalogger (i.e., supports communications listed at right). Our CR206X, CR211X, and CR216X include an internal spread spectrum radio that allow them to communicate wirelessly. The CR295X includes an additional 9-pin serial port that allows communications with the TX320 GOES satellite transmitter.

The CR295X and TX320 GOES satellite transmitter are often used for stream stage, water quality, and rainfall applications.

Internal Spread Spectrum Radio of the CR206X, CR211X, and CR216X

Model	Where Used	Power	Frequency	Communicates With
CR206X	U.S., Canada	250 mW[b]	910 to 918 MHz	CR206(X), RF401A, RF401, RF400, CR205
CR211X	Australia, New Zealand	250 mW[b]	920 to 928 MHz	CR211(X), RF411A, RF411, RF410, CR210
CR216X[c]	many countries worldwide	50 mW	2.450 to 2.482 GHz	RF216(X), RF416, RF432, CR215, RF415

Program Development Tools



Short Cut is available from our website (at no charge) and on our ResourceDVD. It is also bundled with PC200W, PC400, and LoggerNet Software.

The programming language of the CR200X-series dataloggers is CRBasic. Datalogger programs are developed using a program editor (programs cannot be created or edited in the datalogger). Program editors that can be used with these dataloggers include the CRBasic Editor and Short Cut. The CRBasic Editor is included in our PC400 and LoggerNet Datalogger Support Software. Short Cut can be obtained, at no charge, from: www.campbellsci.com/downloads

Communication & Data Collection Tools

PC200W

PC200W, our starter communications software, supports direct communications between a PC and a CR200X-series datalogger and provides numeric display of measurements PC200W can be obtained, at no charge, from: www.campbellsci.com/downloads

PC400

PC400 Datalogger Support Software supports programming, manual data collection, and data display. Both direct and telemetry communications are supported.

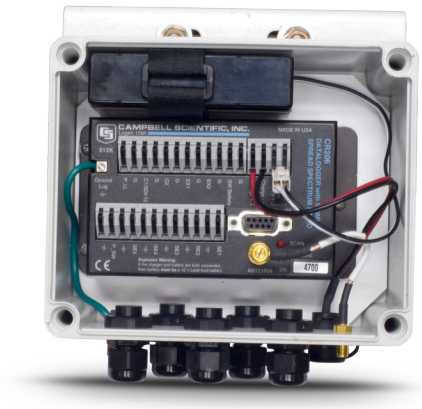
LoggerNet 2.1 or higher

Besides providing all of PC400's functions, LoggerNet Datalogger Support Software supports automatic data collection and PakBus® routing.

[b]Older CR206X dataloggers (serial # < 19122) and older CR211X dataloggers (serial # < 19143) had 100 mW radios. Newer dataloggers that have 250 mW radios must use OS 3 or higher for their datalogger operating system.

[c]Purchase of this product is not recommended for new networks deployed in the European Union (EU) that may require future expansion. This and other RF compatible products will not be available for sale in Europe after 1/1/2015 due to changes in EU legislation.

Enclosures



The ENC200 is a very small enclosure and has the dimensions of 17 cm by 14 cm by 9.4 cm (6.7 in by 5.5 in by 3.7 in).

Applications with minimal power requirements can use the ENC200 enclosure to house the datalogger and the #16869 sealed rechargeable battery. This very small enclosure has one power connector, one antenna connector, and five compression fittings.

The ENC200 cannot house a barometer or a battery that is larger than the #16869. However, an ENC10/12 or ENC12/14 enclosure is adequate for most CR200X, CR206X, CR211X, or CR216X-based systems. An ENC16/18, ENC24/30, or ENC24/30S enclosure can house a CR295X-based system.

Power Supply

Sealed rechargeable battery options for the CR200X, CR206X, CR211X, or CR216X include the BP7 7 Ah battery and the #16869 0.8 Ah battery. These batteries should be recharged either with a solar panel or ac wall charger. Campbell Scientific offers the SP5-L 5 W Solar Panel that attaches directly to the datalogger's terminal strip, and the SP5 5 W Solar Panel that plugs into the ENC200's power connector. AC wall charger options are the #15988 wall charger that attaches directly to the datalogger's terminal strip, and the #16876 wall charger that plugs into the ENC200's power connector.

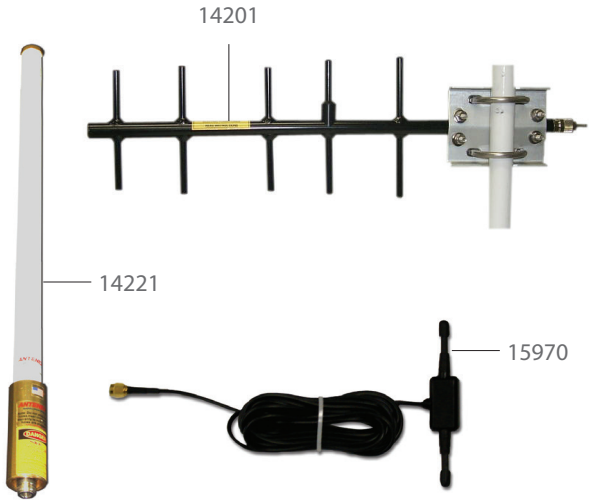
The SP5 and SP5-L capture solar energy via a 72-square inch surface area. These solar panels are suitable for sites with good exposure to sunlight and systems with low power requirements.

Typical power supply for a CR295X-based system consists of a BP12 12 Ah or BP24 24 Ah battery pack, CH150 or CH200 regulator, and SP10 10 W or SP20 20 W solar panel.

Antennas and Antenna Accessories

CR206X and CR211X Antennas

- **14204**—0 dBd, omnidirectional ½ wave whip, jointed, adjustable from 0° to 90°. Connects directly to the datalogger; no antenna cable needed.
- **15970**—1 dBd, dipole supplied with window/wall mount and a 10 foot RG-174 cable for connecting to the datalogger.
- **14221**—3 dBd, omnidirectional with mounts; requires an antenna cable to connect to the datalogger.
- **14201**—9 dBd, Yagi with mounts; requires an antenna cable to connect to the datalogger.



Above are antennas used with the CR206X and CR211X dataloggers. The 14201 Yagi antenna is intended for longer transmission distances.

CR216X Antenna

- **16005**—0 dBd, ½ wave whip articulating. Connects directly to the datalogger; no antenna cable needed.
- **30411**—5.8 dBd (8 dBi), omnidirectional that uses the 13906 mounting hardware; requires an antenna cable to connect to the datalogger.
- **16755**—13 dBd, Yagi with mounts; requires an antenna cable to connect to the datalogger.

Antenna Cables

- **COAXRPSMA-L**—low-loss RG58 cable that is recommended for lengths less than 3 m (10 ft).
- **COAXNTN-L**—low-loss RG8 cable that is recommended for lengths greater than 3 m (10 ft); requires a 14962 or 16982 surge protector kit.

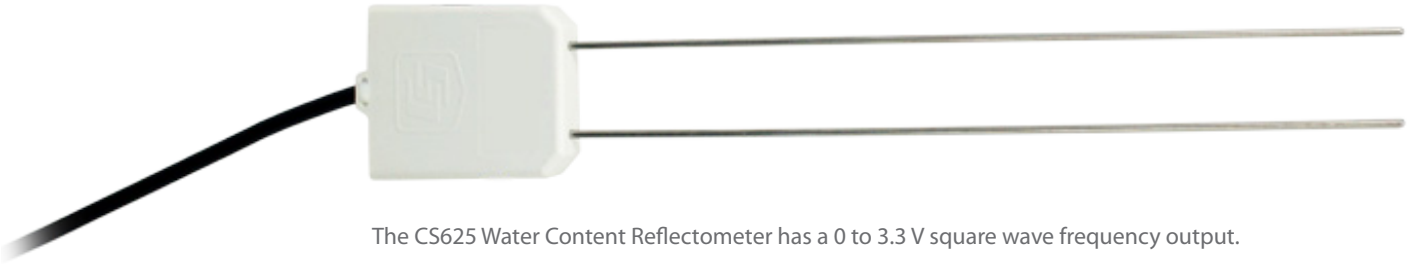
Antenna Surge Protector Kits

- 14462—Surge Protector Kit for the CR206X or CR211X; requires the COAXNTN-L coaxial cable.
- **16982**—Surge Protector Kit for CR216X; requires the COAXNTN-L coaxial cable.

Compatible Sensors[d]

The CR200X-series dataloggers can measure a variety of sensors including SDI-12 sensors and 4 to 20 mA sensors. The parameters and sensors in which the CR200X series can measure are listed below:

- **AC Current**—CS11 Current Transformer.
- **Barometric Pressure**—CS100, CS106, and 092 barometers.
- **Evaporation**—255-100 Evaporation Gauge.
- **Leaf Wetness**—237 and LWS leaf wetness sensors.
- **Multiparameter**—WXT520 Weather Transmitter.
- **Precipitation**—TE525, TE525WS, TE525MM, TB4, TB4MM, CS700, and 52202 tipping bucket rain gages.
- **Relative Humidity**—CS215, HMP60, HC2S3, 083E, and HMP155A air temperature and relative humidity probes.
- **Snow Depth**—SR50A Sonic Ranging Sensor.
- **Soil Volumetric Water Content**— EasyAG probe, EnviroSCAN probe, CS650 reflectometer, CS655 reflectometer, and CS625 reflectometer. *Our CS616 is not compatible.*
- **Solar Radiation**—CS300 Pyranometer. *Our LI200X, LI190SB, LP02, CMP3, CMP6, CMP11, CMP21, NR-LITE2, NR01, and CNR4 probes are not compatible*
- **Temperature**—109, 109SS, and 110PV thermistors. *Other temperature probes listed on our price lists including our 107/108 thermistors and thermocouples are not compatible.*
- **Water Level**—CS451, CS456, and CS460 pressure transducers; CS410 Shaft Encoder; CS470 and CS471 compact bubblers; CS475, CS476, and CS477 pulse radar sensors, and SR50A Sonic Ranging Sensor.
- **Water Quality**—OBS-3+ turbidity probe, OBS300 turbidity probe, OBS500 turbidity probe with antifouling features, CS511 Dissolved Oxygen Probe, 109 Temperature Probe, and 109SS Temperature Probe. *Our CS526, CS547A, CSIM11, CSIM11-ORP, 107, and 108 probes are not compatible.*
- **Wind Speed and Direction**—014A, 034B, 03101, 03002, 05103, 05106, 05305, 27106T, and WindSonic4 sensors. *The WindSonic1, CSAT3, and Zephir300 are not compatible.*

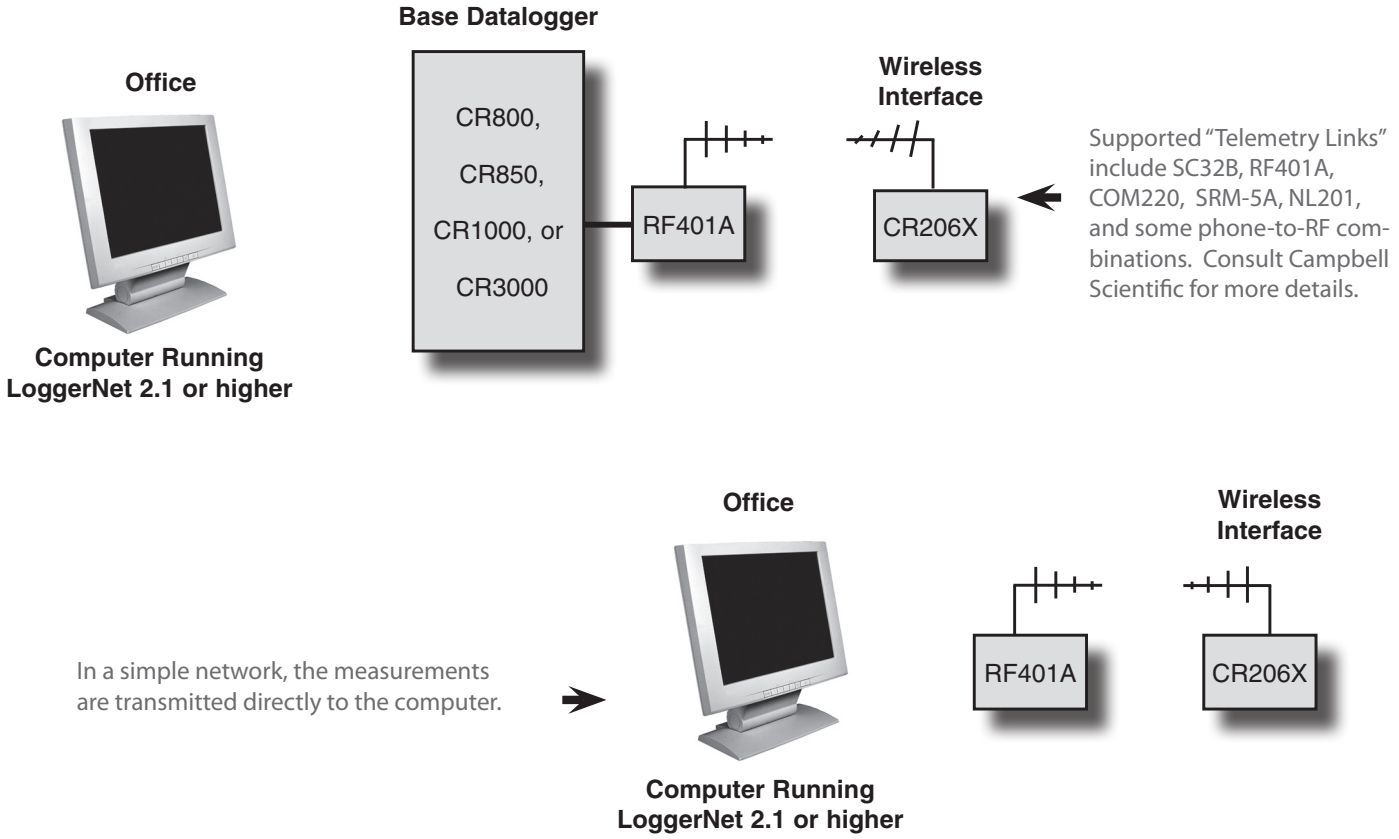


The CS625 Water Content Reflectometer has a 0 to 3.3 V square wave frequency output.

The 109 thermistor can measure air, water, or soil temperature from -50° to +70°C. This probe outputs a signal of 0 to 2.2 V.

[d]The CR200X-series dataloggers can not make differential measurements. They are not compatible with the freezing-rain/ice, fuel moisture/temperature, geographic position, present weather, soil heat flux, snow water equivalent, soil matric water potential, strain, and visibility sensors listed on our price lists. Campbell Scientific's SDMs, CDMs, and multiplexers are also not supported.

CR206X/RF401A-based Wireless Sensor Networks



Applications

Wireless Sensor Networks

The CR206X, CR211X, and CR216X can be used in a wireless sensor network. Wireless sensor networks are appealing because they are often more economical than trenching, laying conduit, and pulling wire. In some applications, cabled sensors are impractical due to man-made or natural causes, including construction, lightning, moving platforms, agricultural production, or bodies of water.

The diagrams at the top of the page depict our CR206X/RF401A-based wireless sensor networks. Our CR211X/RF411A-based and CR216X/RF416-based networks are similar.

All wireless sensor networks require LoggerNet 2.1 or higher software. The base datalogger must use the PakBus communication protocol. The PakBus protocol was optional for our retired CR510, CR10X, and CR23X dataloggers; the PakBus operating system is available, at no charge, from: www.campbellsci.com/downloads for these dataloggers.

Other Applications

- Aquaculture—monitors and records water quality around the clock providing continuous data that can be used to identify trends and improve production.
- Rural Water—provides continuous monitoring of the water system regardless of time of day or time of year. All monitored sites can be networked into one integrated system.
- Water Level/Flow—measures level in many environments including wells, dams, streams, weirs, and water treatment or wastewater treatment plants. Compatible with shaft encoder, pressure transducers, compact bubblers, radar water level sensors, and sonic ranging sensor.
- Water Quality—monitors and records water temperature, pH, dissolved oxygen, and turbidity.
- Wind Energy—can be deployed in a wireless network configuration to provide cost effective monitoring at each level of a wind assessment tower while avoiding long cables.

CR200X-series Datalogger Specifications

Electrical specifications are valid over a -40° to +50°C range unless otherwise specified; non-condensing environment required. We recommend that you confirm system configuration and critical specifications with Campbell Scientific before purchase.

ANALOG INPUTS; DIGITAL I/O

Channels SE1 to SE5 can be individually configured for single-ended measurement or digital I/O.

SINGLE-ENDED MEASUREMENT (SE1 TO SE5):
- Analog Input Range: 0 ≤ V < 2.5 Vdc
- Measurement Resolution: 0.6 mV
- Measurement Accuracy
  - Typical: ±(0.25% of reading + 1.2 mV offset) over -40° to +50°C
  - Worst-case: ±(1% of reading + 2.4 mV offset) over -40° to 50°C

DIGITAL I/O (SE1 TO SE5):
- Input/Output High State: 2.1 to 3.3 Vdc
- Input/Output Low State: <0.9 Vdc
- Output High State: 3.3 V (no load)
- Drive Current: 220 µA @ 2.7 Vdc
- Maximum Input Voltage: 4 Vdc

HALF BRIDGE MEASUREMENTS:
- Accuracy: Relative to the excitation. Using +2.5 Vdc excitation, is ±(0.06% of reading + 2.4 mV)/(2.5 Vdc)

PERIOD AVERAGING (SE1 TO SE4):
- Maximum Input Voltage: 4 Vdc
- Frequency Range: 0 to 150 kHz
- Voltage Threshold: counts cycles on transition from <0.9 Vdc to >2.1 Vdc

EXCITATION CHANNELS (VX1 AND VX2):
- Range: Programmable 0, 2.5, 5 Vdc, or off (floating)
- Accuracy: ±25 mV on +2.5 Vdc range, ±125 mV on +5.0 Vdc range
- Maximum Current: 25 mA on +2.5 Vdc range, 10 mA on +5.0 Vdc range

CONTROL PORTS (C1 AND C2)

DIGITAL I/O:
- Voltage Level When Configured as Input: <0.9 Vdc (low state) to >2.7 Vdc (high state)
- Voltage Level When Configured as Output: 0 V (low state), 5 Vdc (high state) (no load)
- Logic Level: TTL
- Drive Current: 1.5 mA @ 4.5 V

SDI-12: SDI-12 sensors connect to C1

PULSE COUNTERS

SWITCH CLOSURE (P_SW):
- Maximum Count Rate: 100 Hz
- Minimum Switch Open Time: 5 ms
- Minimum Switch Closed Time: 5 ms
- Maximum Bounce Time: 4 ms

PULSE COUNT (P_SW, C1, AND C2):
- Voltage Threshold: count on transition from <0.9 V to >2.7 Vdc
- Minimum Pulse Width: 320 µs
- Maximum Input Frequency: 1 kHz
- Max Input Voltage: C1 & C2 (6.5 V), P_SW (4 Vdc)

LOW LEVEL AC (P_LL):
- Voltage Threshold: <0.5 to >2 V
- Minimum Input: 20 mV RMS
- Maximum Frequency: 1 kHz
- Maximum Input: ±20 V

Note: C1 and C2 can be used for switch closure using the battery voltage and a 100 kOhm pull-up resistor. If the dc offset is >0.5 V, then AC coupling is required.

COMMUNICATIONS

SERIAL INTERFACE: Female RS-232 9-pin interface for logger-to-PC communications

ON-BOARD SPREAD SPECTRUM RADIO:
- Frequency: 915 MHz (CR206X), 922 MHz (CR211X), or 2.4 GHz (CR216X)
- Transmission Range: 1 mile with 0 dBd ¼ wave antenna (line-of-sight) and 900 MHz radios; 0.6 miles (1 km) with 0 dBd ½ wave antenna (line-of-sight) and 2.4 GHz radio; up to 10 miles with higher gain antenna (line-of-sight)
- RF4XX used as a base station radio
- Transmitter Power Output: 250 mW (CR206X, CR211X); 50 mW (CR216X)

AVAILABLE RADIO TRANSMISSION MODES:
- Always on, program controlled
- Cycle Time: 1 or 8 s cycles; on for 100 ms every period; checks for incoming communication
- Scheduled Transmission Time: off until transmission time
- PakBus® packet switching network protocol

CLOCK ACCURACY

8.2 minutes/month @ -40° to +50°C; 1 minute/month @ +25°C

CPU AND STORAGE

FINAL STORAGE: 512 kB flash memory, data format is 4 Bs per data point

INTERMEDIATE STORAGE: 8 kB SRAM

COMPILED PROGRAM STORAGE: up to 19.2 kB flash memory depending on structure of CRBasic program

OPERATING SYSTEM: 106 kB flash memory

FASTEST SCAN RATE: once per second

SWITCHED BATTERY (SW BATTERY)

Switched under program control; 300 mA minimum current available

POWER

BATTERY VOLTAGE RANGE: 7 to 16 Vdc (can program datalogger to measure internal battery voltage)

MAXIMUM CONTINUOUS BATTERY CHARGING CURRENT:
0.9 A @ 20°C; 0.65 A @ 50°C

RECOMMENDED BATTERIES: 12 Vdc, 7 A h or smaller sealed rechargeable battery when connected to the on-board charging circuit. Using larger batteries with the datalogger's built-in charger may result in excessive PC board heating. This is especially a concern when the battery is deeply discharged or failing with a shorted cell. Alkaline cells, lithium, or other non-rechargeable battery types may be connected if the charging circuit is not used (i.e., nothing connected to Charge terminals).

CHARGER INPUT VOLTAGE: 16 to 22 Vdc

SOLAR PANEL: 10 W or smaller when using on-board charging circuit.

WALL CHARGER: 1 A or smaller when using on-board charging circuit.

SHELF LIFE OF CLOCK'S BACKUP BATTERY: 5 years

CURRENT DRAIN (@12 V)

QUIESCENT CURRENT DRAIN:
No Radio or Radio Powered Off: ~0.2 mA

ACTIVE CURRENT DRAIN:
- No radio ~3 mA
- Radio receive ~20 mA (CR206X, CR211X), ~36 mA (CR216X)
- Radio transmit ~75 mA (CR206X, CR211X, CR216X)

AVERAGE CONTINUOUS CURRENT DRAIN:
- Radio always on ~20 mA (CR206X, CR211X), ~36 mA (CR216X)
- Radio in 1 s duty cycle ~2.2 mA (CR206X, CR211X), ~4 mA (CR216X)
- Radio in 8 s duty cycle ~0.45 mA (CR206X, CR211X), ~0.8 mA (CR216X)

CE COMPLIANCE (as of 01/15)

CE COMPLIANT DATALOGGERS: CR200X, CR206X, CR211X

STANDARD(S) TO WHICH CONFORMITY IS DECLARED: IEC61326:2002

EMI AND ESD PROTECTION

IMMUNITY: Meets or exceeds following standards:
- ESD: per IEC 1000-4-2; ±8 kV air, ±4 kV contact discharge
- RF: per IEC 1000-4-3; 3 V/m, 80-1000 MHz
- EFT: per IEC 1000-4-4; 1 kV power, 500 V I/O
- Surge: per IEC 1000-4-5; 1 kV power and I/O
- Conducted: per IEC 1000-4-6; 3 V 150 kHz-80 MHz

Emissions and immunity performance criteria available on request.

PHYSICAL

CASE DESCRIPTION: Aluminum with spring-loaded terminals

DIMENSIONS (including terminals):
14.0 cm x 7.6 cm x 5.1 cm; 5.5 in x 3 in x 2 in

WEIGHT:
CR200X or CR295X: 242 g (8.5 oz)
CR206X, CR211X, or CR216X: 271 g (9.5 oz)

CUSTOM CASE: available for OEM applications; contact Campbell Scientific

WARRANTY

Three year covering parts and labor.

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

Global Sales & Support Network

A worldwide network of companies to help meet your needs

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